

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Patent Application No. 10/754,390

Applicant: Prasad et al.

Filed: January 9, 2004

TC/AU: 3723

Examiner: Muller, Bryan R.

Docket No.: 100196 (LVM Reference No. 223279)

Customer No.: 29050

**APPELLANTS' APPEAL BRIEF**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In support of the appeal from the final rejection dated January 3, 2008, Appellants now submit their Brief.

*Real Party In Interest*

The patent application that is the subject of this appeal is assigned to Cabot Microelectronics Corporation.

*Related Appeals and Interferences*

There are no appeals or interferences that are related to this appeal.

*Status of Claims*

Claims 1-21 are currently pending and are set forth in the Appendix attached hereto. Claims 1-21 are rejected and are the subject of this appeal.

*Status of Amendments*

No amendments have been filed subsequent to the final rejection.

*Summary of Claimed Subject Matter*

There are two independent claims, namely claims 1 and 18.

Claim 1 is directed to a chemical-mechanical polishing pad comprising a porous polymeric material (page 2, lines 34-35; page 3, line 28, to page 4, line 2; page 4, lines 13-19), wherein the porous polymeric material has a Poisson's ratio less than 0 (page 2, lines 35-36; page 3, lines 27-28).

Claim 18 is directed to a method of polishing a substrate comprising (i) providing a substrate to be polished (page 2, lines 28-29), (ii) contacting the substrate with a chemical-mechanical polishing system comprising a polishing pad (page 2, lines 29-30; page 7, lines 31-33) comprising a porous polymeric material (page 2, lines 34-35; page 3, line 28, to page 4, line 2; page 4, lines 13-19), wherein the porous polymeric material has a Poisson's ratio less than 0 (page 2, lines 35-36; page 3, lines 27-28), and (iii) abrading at least a portion of the surface of the substrate with the polishing system to polish the substrate (page 2, lines 30-31; page 7, lines 33-36).

*Grounds of Rejection to be reviewed on Appeal*

(A) Claims 1-7 and 16-20 are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt (i.e., U.S. Patent 6,095,902) in combination with Lakes (i.e., U.S. Patent 4,668,557) and Furukawa et al. (i.e., WO 03/058698 A1 (U.S. Patent Publication 2005/0107007 A1 as English language equivalent)).

(B) Claims 8 and 10 are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Sevilla et al. (i.e., U.S. Patent 6,126,532).

(C) Claim 9 is rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Suzuki et al. (i.e., U.S. Patent 6,120,353).

(D) Claims 11-13 are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Osterheld et al. (i.e., U.S. Patent 6,241,596).

(E) Claims 14, 15, 21 are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes and Furukawa et al. in further combination with Tang (i.e., U.S. Patent 5,949,927).

### *Argument*

#### *A. Rejection of Claims 1-7 and 16-20 under 35 U.S.C. § 103(a) over Reinhardt in combination with Lakes and Furukawa et al.*

For subject matter defined by a claim to be considered obvious, the Office must demonstrate that the differences between the claimed subject matter and the prior art “are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a); see also *Graham v. John Deere Co.*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966). The ultimate determination of whether an invention is or is not obvious is based on certain factual inquiries including: (1) the scope and content of the prior art, (2) the level of ordinary skill in the prior art, (3) the differences between the claimed invention and the prior art, and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18, 148 U.S.P.Q. at 467.

##### *1. Scope and Content of the Prior Art*

Reinhardt generally discloses porous polishing pads comprising polyether and/or polyester polyurethanes. Reinhardt teaches that porous materials aid in the polishing due to their ability to hold and carry polishing slurry (col. 1, lines 17-26). Moreover, Reinhardt teaches that the final polymeric product preferably has certain physical properties, such as a specified tensile modulus, yield stress, tensile strength, and elongation to break, thereby making it suitable for polishing (col. 2, line 64, to col. 3, line 2).

Lakes discloses the use of a negative Poisson's ratio material in cushions, plugs, air filters, shoe soles, sandwich panels, humidifier belts, sound absorbers, sponges, gaskets, and medical supplies (col. 4, line 47, through col. 6, line 2).

Furukawa et al. discloses three requirements for polishing pads: (1) high polishing speed, (2) long life of the polishing pad, i.e., polishing pad materials must have high abrasion resistance, and (3) high planarizing ability (paragraphs 0007-0009). Furukawa et al. further discloses that these three requirements can be achieved with a polishing pad comprising fabric and a *nonporous* resin (paragraph 0026).

## 2. *Level of Ordinary Skill in the Art*

For the purposes of the present argument, one of ordinary skill in the art can be treated as someone with an advanced chemistry degree and at least a few years of experience in the field of chemical-mechanical polishing of substrates.

## 3. *Differences Between Claimed Invention and Prior Art*

There are substantial differences between the prior art and the claimed invention.

As acknowledged in the Office Action, Reinhardt, which is the reference disclosing porous polishing pads, fails to teach or suggest a polishing pad comprising a porous polymer material having a negative Poisson's ratio. In addition, Lakes, which is the reference disclosing a negative Poisson's ratio polymer material and its potential uses, fails to teach or suggest using the specialized material in a polishing pad or anything resembling a polishing pad. The Examiner relies solely on the teachings of Furukawa et al. to link Reinhardt and Lakes and thus provide the motivation to combine the elements of Reinhardt and Lakes to achieve the claimed invention. However, contrary to the Examiner's assertions, the teachings of Furukawa et al. actually teach away from the claimed invention.

Specifically, Furukawa et al. states that porous, i.e., closed cell and open cell, polymeric materials

have a drawback of clogging by precipitates in a relative short period of time. Thus, in order to maintain a high polishing speed, it is necessary to remove the clogged region on the surface of the polishing pad with the dresser frequently.

Thus, they have-problems [sic] that long dressing time in a total during polishing is required and that the polishing pad has a short life. Thus, the polishing pads comprising such polyurethane foams have not always satisfied the above three requirements for the polishing pad (thus, a high polishing speed, abrasion resistance, planarizing ability).

(paragraph 0012). Thus, Furukawa et al. teaches that the *inherent structure* of porous materials is the cause of short pad life due to the requirement of increased pad conditioning and/or dressing time. As such, Furukawa et al. teaches the use of nonporous materials to overcome the shortcomings of conventional polyurethane foams (paragraphs 0018 and 0026).

#### 4. *Objective Evidence of Unobviousness*

For purposes of the present argument, Applicants have no need to refer to any objective evidence of unobviousness of the present invention as defined by the appealed claims.

#### 5. *Consideration of Graham Factors Together*

As previously discussed, there are substantial differences between the prior art and the claimed invention. In order to arrive at the present invention by combining the teachings of Lakes and Reinhardt, one of ordinary skill in the art, at the time of invention, would have had to ignore the stated preference of Furukawa et al., the linking reference, for *nonporous* polymeric materials due the *inherent structural* limitations of porous materials. Thus, contrary to the assertions of the Office Action, one of ordinary skill in the art at the time of the invention would not have been motivated to replace one porous polymeric material, i.e., a positive Poisson ratio material, with another porous polymer material, i.e., negative Poisson ratio material, based on the disclosure of Furukawa et al. alone or in combination with Reinhardt and Lakes.

Applicants contend that the Examiner improperly relies on Furukawa et al. for the limited disclosure that “high abrasion resistance is a requirement for long life of polishing pad … [and] that polishing pads made of foamed polyurethane … generally fail have the desired abrasion resistance.” Office Action dated January 3, 2008, page 3. Specifically, the Examiner states that

[t]he Furukawa reference is merely provided to support the Examiner's statement that it is well known in the art of polishing pads that strength and abrasion resistance are desired properties for polishing pads. Thus, the Reinhardt reference clearly provides the porous polymeric polishing pad, whereas the Furukawa reference is merely applied as extrinsic evidence that abrasion resistance is a desired property for polishing pads.

Office Action dated January 3, 2008, page 8.

However, as stated by the Court of Customs and Patent Appeals and re-affirmed by the Federal Circuit,

[i]t is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given proposition to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art.

*Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 448, 230 U.S.P.Q. 416, 419 (Fed. Cir. 1986), *citing In re Wesslau*, 353 F.2d 238, 241, 147 U.S.P.Q. 391, 393 (C.C.P.A. 1965). Thus, the Examiner fails to consider Furukawa et al. in its entirety, thereby ignoring the suggestion that *any* porous material, due to its inherent structure, will have a short pad life and that high abrasion resistance is preferably achieved with a nonporous material.

In view of the foregoing comments concerning each of the *Graham* factors, Applicants respectfully submit that the subject matter defined by appealed claims 1-7 and 16-20 is unobvious over the combination of Reinhardt, Lakes, and Furukawa et al., and that the obviousness rejection should be reversed.

*B. Rejection of Claims 8 and 10 under 35 U.S.C. § 103(a) over Reinhardt in combination with Lakes, Furukawa et al., and Sevilla et al.*

Claims 8 and 10, which depend from claim 1, are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes, Furukawa et al., and Sevilla et al. The deficiencies of Reinhardt, Lakes, and Furukawa et al. have been discussed with

respect to the obviousness rejection as applied to appealed claims 1-7 and 16-20. The discussion above is equally applicable to this obviousness rejection.

Sevilla et al. fails to remedy the deficiencies of Reinhardt, Lakes, and Furukawa et al. Sevilla et al. generally relates to polishing pads made of a porous substrate and does not disclose or suggest a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0. Therefore, since Furukawa et al. teaches away from the proposed modification of replacing one porous polymeric material, i.e., a positive Poisson ratio material, with another porous polymer material, i.e., negative Poisson ratio material, one of ordinary skill in the art would not be motivated to combine Reinhardt, Lakes, and Furukawa et al. with Sevilla et al. in such a way as to arrive at the invention. Under the circumstances, the obviousness rejection is improper and should be reversed.

*C. Rejection of Claim 9 under 35 U.S.C. § 103(a) over Reinhardt in combination with Lakes, Furukawa et al., and Suzuki et al.*

Claim 9, which depends from claim 1, is rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes, Furukawa et al., and Suzuki et al. The deficiencies of Reinhardt, Lakes, and Furukawa et al. have been discussed with respect to the obviousness rejection as applied to appealed claims 1-7 and 16-20. The discussion above is equally applicable to this obviousness rejection.

Suzuki et al. fails to remedy the deficiencies of Reinhardt, Lakes, and Furukawa et al. Suzuki et al. generally relates to polishing pads made of a urethane foam and does not disclose or suggest a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0. Therefore, since Furukawa et al. teaches away from the proposed modification of replacing one porous polymeric material, i.e., a positive Poisson ratio material, with another porous polymer material, i.e., negative Poisson ratio material, one of ordinary skill in the art would not be motivated to combine Reinhardt, Lakes, and Furukawa et al. with Suzuki et al. in such a way as to arrive at the invention. Under the circumstances, the obviousness rejection is improper and should be reversed.

*D. Rejection of Claims 11-13 under 35 U.S.C. § 103(a) over Reinhardt in combination with Lakes, Furukawa et al., and Osterheld et al.*

Claims 11-13, which depend from claim 1, are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes, Furukawa et al., and Osterheld et al. The deficiencies of Reinhardt, Lakes, and Furukawa et al. have been discussed with respect to the obviousness rejection as applied to appealed claims 1-7 and 16-20. The discussion above is equally applicable to this obviousness rejection.

Osterheld et al. fails to remedy the deficiencies of Reinhardt, Lakes, and Furukawa et al. Osterheld et al. generally relates to polishing pads comprising a patterned surface having slurry distribution/retaining grooves and does not disclose or suggest a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0. Therefore, since Furukawa et al. teaches away from the proposed modification of replacing one porous polymeric material, i.e., a positive Poisson ratio material, with another porous polymer material, i.e., negative Poisson ratio material, one of ordinary skill in the art would not be motivated to combine Reinhardt, Lakes, and Furukawa et al. with Osterheld et al. in such a way as to arrive at the invention. Under the circumstances, the obviousness rejection is improper and should be reversed.

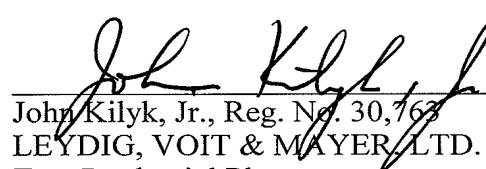
*E. Rejection of Claims 14, 15, and 21 under 35 U.S.C. § 103(a) over Reinhardt in combination with Lakes, Furukawa et al., and Tang*

Claims 14 and 15, which depend from claim 1, and claim 21, which depends from claim 18, are rejected under 35 U.S.C. § 103(a) as allegedly obvious over Reinhardt in combination with Lakes, Furukawa et al., and Tang. The deficiencies of Reinhardt, Lakes, and Furukawa et al. have been discussed with respect to the obviousness rejection as applied to appealed claims 1-7 and 16-20. The discussion above is equally applicable to this obviousness rejection.

Tang fails to remedy the deficiencies of Reinhardt, Lakes, and Furukawa et al. Tang generally relates to an *in-situ* monitoring technique for end point detection during chemical-mechanical polishing and does not disclose or suggest a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0. Therefore, since Furukawa et al. teaches away from the proposed modification of replacing

one porous polymeric material, i.e., a positive Poisson ratio material, with another porous polymer material, i.e., negative Poisson ratio material, one of ordinary skill in the art would not be motivated to combine Reinhardt, Lakes, and Furukawa et al. with Tang in such a way as to arrive at the invention. Under the circumstances, the obviousness rejection is improper and should be reversed.

Respectfully submitted,

  
John Kilyk, Jr., Reg. No. 30,763  
LEYDIG, VOIT & MAYER LTD.  
Two Prudential Plaza  
180 North Stetson Ave., Suite 4900  
Chicago, Illinois 60601-6731  
(312) 616-5600 (telephone)  
(312) 616-5700 (facsimile)

Date: April 29, 2008

*Claims Appendix*

1. (Original) A chemical-mechanical polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0.
2. (Original) The polishing pad of claim 1, wherein the porous polymeric material has a Poisson's ratio of from about -1 to less than 0.
3. (Original) The polishing pad of claim 2, wherein the porous polymeric material has a Poisson's ratio of from about -0.8 to about -0.2.
4. (Original) The polishing pad of claim 1, wherein the porous polymeric material is a thermoplastic polymer or a thermoset polymer.
5. (Original) The polishing pad of claim 4, wherein the thermoplastic polymer or the thermoset polymer is selected from the group consisting of polyurethanes, polyolefins, polyvinylalcohols, polyvinylacetates, polycarbonates, polyacrylic acids, polyacrylamides, polyethylenes, polypropylenes, nylons, fluorocarbons, polyesters, polyethers, polyamides, polyimides, polytetrafluoroethylenes, polyetheretherketones, copolymers thereof, and mixtures thereof.
6. (Original) The polishing pad of claim 5, wherein the thermoplastic polymer or the thermoset polymer is selected from the group consisting of polyurethanes and polyolefins.
7. (Original) The polishing pad of claim 1, wherein the polishing pad has a density of about 1 g/cm<sup>3</sup> or less.
8. (Original) The polishing pad of claim 1, wherein the polishing pad has a void volume of about 75% or less.
9. (Original) The polishing pad of claim 1, wherein the polishing pad has a pore density of greater than about 10 pores/cm.

10. (Original) The polishing pad of claim 1, wherein the pore size is from about 0.1  $\mu\text{m}$  to about 2500  $\mu\text{m}$ .

11. (Original) The polishing pad of claim 1, wherein the polishing pad further comprises a polishing surface comprising grooves.

12. (Original) The polishing pad of claim 11, wherein the grooves are linear grooves.

13. (Original) The polishing pad of claim 11, wherein the grooves are in the form of an XY crosshatch.

14. (Original) The polishing pad of claim 1, wherein the polishing pad further comprises a substantially optically transmissive region.

15. (Original) The polishing pad of claim 14, wherein the substantially optically transmissive region has a light transmission of at least 10% at one or more wavelengths between from about 190 nm to about 3500 nm.

16. (Original) The polishing pad of claim 1, wherein the polishing pad further comprises abrasive particles.

17. (Original) The polishing pad of claim 16, wherein the abrasive particles comprise metal oxide selected from the group consisting of alumina, silica, titania, ceria, zirconia, germania, magnesia, co-formed products thereof, and combinations thereof.

18. (Previously Presented) A method of polishing a substrate comprising  
(i) providing a substrate to be polished,  
(ii) contacting the substrate with a chemical-mechanical polishing system comprising a polishing pad comprising a porous polymeric material, wherein the porous polymeric material has a Poisson's ratio less than 0, and  
(iii) abrading at least a portion of the surface of the substrate with the polishing system to polish the substrate.

19. (Original) The method of claim 18, wherein the polishing pad further comprises abrasive particles.

20. (Original) The method of claim 19, wherein the abrasive particles comprise metal oxide selected from the group consisting of alumina, silica, titania, ceria, zirconia, germania, magnesia, co-formed products thereof, and combinations thereof.

21. (Original) The method of claim 18, wherein the method further comprises detecting *in situ* a polishing endpoint.

*Evidence Appendix*

Not applicable

*Related Proceedings Appendix*

Not applicable